

United States Patent Application for

TRIAD PICKUP

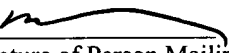
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For: TRIAD PICKUP

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TRIAD PICKUP

This invention claims the benefit of priority to U.S. Provisional Application
60/440,135 filed January 15, 2003.

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FIELD OF INVENTION

This invention relates to pickup mounts for musical instruments, in particular to a
combined triad pickup and preamp device that combines a magnetic sound-hole pickup, a
transducer vibration pickup and a sound microphone pickup into a single housing, and
10 methods of mounting and using the combined pickup with stringed instruments such as
guitars, and connecting the combined pickup to exterior amplifiers, and the like.

BACKGROUND AND PRIOR ART

Pickup blender devices have been used in guitar type stringed instruments and
15 generally require the devices be mounted to the sides of the guitars. These blender
devices further generally require slider switches that the user must slide in order to
control the pickup devices. Thus, the location of these traditional pickup devices and the
slider knob controls are undesirable and impractical to the user. For example, the user
must physically remove their fingers from the strings to manipulate the slider type knobs.
20 Additionally, the side mounting of these devices can be destructive to the guitar since a
user must cut an opening in the side of a guitar type instrument.

Many of the known pickup blender devices rely on using one or more identical
pickup sensors which further restricts the versatility of the device. Furthermore, the
blender devices tend to combine the output into single cables that connect to externally

mounted amplifiers. Thus, the pickup devices do not allow for much tenability, and do not allow for each of the pickup sensors to be individually tuned.

Throughout the history of acoustic pickup systems there have been three basic types of acoustic pickups: Magnetic Pickup, Transducer Pickup and Under the Bridge Saddle Transducer. Each one has its highlights and flaws and companies have endlessly attempted to engineer the best tone out of each design. The Magnetic Pickup: (Also called a sound-hole pickup.) have been installed in the sound-hole and “pick up” the magnetic responses of the strings—similar to a pickup used on an electric guitar. The pickup’s coil windings, pole-piece sizes, and magnet size are all designed to produce the most accurate “acoustic” tone. The magnetic pickup is usually more bass responsive. The pickup actually receives its response from the magnetic steel core of bronze or brass acoustic guitar strings. These pick-ups produce very little feed back, do not normally need a pre-amp, some are portable “pop-ins,” and they are the most popular for quick installs and a decent tone.

Transducer pickups sense vibrations. Two types have been popular a stick-on style, which may be placed at different locations on the guitar top, and an Under-The-Bridge-Saddle pickup, which is installed under the bridge saddle. Unfortunately, with stick-on type transducers, the response from the top of the guitar will also pick up unwanted nuances such as finger, pick, and arm noises. The under-The-Bridge-Saddle transducer pickup reduces unwanted noises and has good acoustic tone. The tone is more “trebly” than the magnetic pickup. It may be used with or without a pre-amp. Using a pre-amp will increase the response, and with tone controls can be an excellent choice for a permanent install.

Condenser Microphone pickups have been known to be placed inside the guitar produce very good acoustic tones. However, care must be used because of increased feedback possibilities and the inherent proximity effect. Simply, the proximity effect will tend to produce higher levels of bass tones. Also, for superior tone, a condenser microphone
5 would still must be used and driven by a battery powered pre-amp.

None of the prior art is known to adequately combine the various pickups.

Several patents have been proposed over the years related to pickup mounts for stringed type instruments. See for example, U.S. Patents: 3,869,952 to Rowe; 4,151,776 to Stich; 4,245,540 to Group; 4,872,386 to Betticare; 5,438,158 to Roboloff; 5,557,058
10 to Lace; 5,637,823 to Dodge; 5,693,898 to Fishman; 5,763,808 to Thomson; 5,837,912 to Eagen; 5,866,834 to Burke et al.; 6,111,184 to Cloud et al.; 6,121,537 to Pawar et al.; and 6,278,059 to Lefton.

However, none of the prior art adequately solves the problems presented above. Thus, the need exists for solutions to the above problems.

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SUMMARY OF THE INVENTION

A primary objective of the present invention is to provide a multi-sensor pickup unit for stringed instruments and method of use that can be mounted without damaging the instrument, and does not require cutting unsightly, tone changing sections or holes.

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A secondary objective of the present invention is to provide multi-sensor type pickup unit for stringed instruments and method of use that can be removably mounted in the sound hole.

A third objective of the present invention is to provide a multi-sensor type pickup unit for stringed instruments and method of use having controls adjacent to the strings within easy reach of the user.

5 A fourth objective of this invention is to provide a multi-sensor type pickup unit for stringed instruments and method of use having easily adjustable non-slider controls for the unit.

A fifth objective of the present invention is to provide a multi-sensor type pickup unit for stringed instruments and method of use having three different non-identical pickup sensors.

10 A sixth objective of the present invention is to provide a multi-sensor type pickup unit for stringed instruments and method of use that provides separate tuning for each pickup sensor.

A seventh objective of the present invention is to provide a multi-sensor type pickup unit for stringed instruments and method of use that can include separate inputs
15 for treble, middle and bass for each pickup sensor.

An eighth objective of the present invention is to provide a magnetic pickup for stringed instruments having an extremely low noise, and a single coil with individual string adjustments for balanced tone.

A ninth objective of the present invention is to provide an Under-The-Bridge-
20 Saddle type (piezo-electric) transducer for a stringed instrument having independent response of each string, with a casing that provides a level surface for equal string volume.

A tenth objective of the present invention is to provide a high quality Condenser microphone for a stringed instrument that can be located the pickup device.

An eleventh objective of the present invention is to provide a pickup system for stringed instruments that can use Gold plated pole pieces, connectors, and End-Pin Jack.

A twelfth objective of the present invention is to provide a pickup system for stringed instrument having a pre-amp system that is conveniently “hidden” within the pickup assembly.

A thirteenth objective of the present invention is to provide a pickup system for stringed instruments that is easy to install, does not require soldering, and can be installed quickly within up to approximately 30 to approximately 45 minutes.

A fourteenth objective of the present invention is to provide a pickup system for stringed instruments that can be easily removed, as all components can use plug-style connectors.

A fifteenth objective of the present invention is to provide a pickup system for stringed instruments having easily reached volume controls for onboard adjustments.

A sixteenth objective of the present invention is to provide for multi-pickup sensors for a stringed instrument such as a guitar that includes controls that are easily reachable to the user’s fingers while the fingers are on the strings of the instrument.

The novel triad pickup invention can utilize all three types of acoustic amplification devices that were described in the background section of the invention: a superior Magnetic pickup, a superb Under-The-Bridge-Saddle transducer pickup, and a high quality Condenser Microphone which is located inside triad device. The invention incorporates three separate pickups and a preamp, all part of one housing.

The novel triad pick-up system can include a main housing for being removably mounted into a sound hole of a stringed instrument, such as an acoustic guitar. Three different pickup sensors, such as a piezo-electric transducer, a microphone, and a

magnetic sensor can be connected to the housing. The novel triad unit housing can include four easily reachable blender volume controls on the sides of the housing(two on each side) so that the performer can easily blend each pickup into a mono output. The unit housing can be attached to a power supply such as a 9 volt battery, and the like, and
5 the mono signal can be easily amplified using a 1/4 inch phono type cable.

Further objects and advantages of this invention will be apparent from the following detailed description of the presently preferred embodiments which are illustrated schematically in the accompanying drawings.

10 BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is a perspective exterior view of a guitar with the novel triad pickup device.

Fig. 2 is an enlarged view of the triad pickup device mounted in the music box in Fig. 1.

Fig. 3 is a front view of the guitar of Fig. 1 with mounted triad pickup device.

Fig. 4 is a side cross-sectional view of the guitar of Fig. 3 along arrow 4.

15 Fig. 5 is a side view of the guitar of Figures 1, 3.

Fig. 6 is a cross-sectional view of the guitar of Fig. 5 along arrow 6.

Fig. 7 is another front view of the guitar of the preceding figures.

Fig. 8 is an enlarged cross-sectional view of the mounted triad pickup device in the guitar of Fig. 7 along arrow 8.

20 Fig. 9 is another front view of the guitar of the preceding figures.

Fig. 10 is an enlarged cross-sectional view of the mounted triad pickup device in the guitar of Fig. 9 along arrow 10.

Fig. 11 shows the novel triad pickup device separated from the music box of the guitar of the preceding figures.

Fig. 11A is an enlarged view of the separated triad pickup device of Fig. 11.

Fig. 12 is an exploded view of the novel triad pickup device of the preceding figures.

Fig. 13 is a front view of the main housing of the triad pickup device.

Fig. 14 is a top view of the main housing of Fig. 13 along arrow 14.

5 Fig. 15 is a right side view of the main housing of Fig. 13 along arrow 15.

Fig. 16 is a rear view of the main housing of Fig. 14 along arrow 16.

Fig. 17 is a left side view of the main housing of Fig. 13 along arrow 17.

Fig. 18 is a bottom view of the main housing of Fig. 13 along arrow 18.

Fig. 19 is a schematic of the circuit configuration for all input signals from the transducer
10 pickup, microphone pickup and magnetic pickup as a triad pickup sensors to be amplified
and mixed into one composite output signal.

Fig. 20 is a schematic of the circuit configuration of Fig. 19 for all input signals from the
triad pickup sensors to be amplified and the transducer signals to be output individually.

15 DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before explaining the disclosed embodiments of the present invention in detail it
is to be understood that the invention is not limited in its application to the details of the
particular arrangements shown since the invention is capable of other embodiments.

Also, the terminology used herein is for the purpose of description and not of limitation.

20 A list of the components used in the figures is given below.

- | | |
|----|------------------------|
| 1 | Instrument |
| 2 | Saddle |
| 5 | Bridge |
| 10 | Strings |
| 25 | 12 Triad Pickup Device |
| | 15 Housing |
| | 20 Soundboard Surface |

		25MG Magnetic Transducer Potentiometer Knob
		25PI Piezoelectric Transducer Potentiometer Knob
		25MC Microphone Transducer Potentiometer Knob
		25MAS Master Potentiometer Knob
5	30	Clamping Screw
	35	Sound Hole
	40	Magnet Pole Screw
	43	2 Conductor Cable
	45	Output Jack
10	50	Battery
	55	Battery Connector Harness
	60	Inside Soundboard Surface
	65	Piezo Pickup Connector Harness
	70	Output Connector Harness
15	75	Microphone
	80	Clamp
	85	Elastomer Pad
	87	Magnetic Transducer
	90	Coil
20	95	Magnet
	100	Adjustment Bar
	105	Piezo Transducer
	110	Control Circuit Board
	115	Preamp Board Retainer Screw
25	120	Coil Retainer Screw
	125	Housing Slot
	130	Preamp Board
	135	Threaded Body
	140	Threaded Aperture
30	145	Microphone Aperture
	150	Resonator Cavity
	160	Battery Clip
	170	Adhesive Pad
	175	Magnet Pole Screw Aperture
35	180	Screw Boss
	185	Inside Wall
	190	Output Jack Aperture
	195	Output Jack Nut
	200	Triple Output Connector
40	210	Hard Wired Cable to Housing
	215	4 Conductor Output Jack
	220	4 Conductor Jack
	225	External Cable
	230	Microphone Output
45	240	Piezo Transducer Output
	250	Magnetic Transducer Output
	300	External Amplifier

310 Cable to Amplifier

Fig. 1 is a perspective exterior view of a stringed instrument 1 such as a guitar, and the like, with the novel triad pickup device 12. Fig. 2 is an enlarged view of the triad pickup device 12 mounted in the music box 35 in Fig. 1. Fig. 3 is a front view of the guitar 1 of Fig. 1 with mounted triad pickup device 12. Fig. 4 is a side cross-sectional view of the guitar 1 of Fig. 3 along arrow 4. Fig. 5 is a side view of the guitar 1 of Figures 1, 3. Fig. 6 is a cross-sectional view of the guitar 1 of Fig. 5 along arrow 6. Fig. 7 is another front view of the guitar 1 of the preceding figures. Fig. 8 is an enlarged cross-sectional view of the mounted triad pickup device 12 in the guitar 1 of Fig. 7 along arrow 8. Fig. 9 is another front view of the guitar 1 of the preceding figures. Fig. 10 is an enlarged cross-sectional view of the mounted triad pickup device 12 in the guitar 1 of Fig. 9 along arrow 10. Fig. 11 shows the novel triad pickup device 12 separated from the music box of the guitar 1 of the preceding figures. Fig. 11A is an enlarged view of the separated triad pickup device 12 of Fig. 11. Fig. 12 is an exploded view of the novel triad pickup device 12 of the preceding figures. Fig. 13 is a front view of the main housing 15 of the triad pickup device 12. Fig. 14 is a top view of the main housing 15 of Fig. 13 along arrow 14. Fig. 15 is a right side view of the main housing 15 of Fig. 13 along arrow 15. Fig. 16 is a rear view of the main housing 15 of Fig. 14 along arrow 16. Fig. 17 is a left side view of the main housing 15 of Fig. 13 along arrow 17. Fig. 18 is a bottom view of the main housing 15 of Fig. 13 along arrow 18.

Referring to Figures 1-18, the novel musical instrument audio triad pickup device 12 provides a system to allow three different transducers 75, 87, 105 to be located at three different locations within a stringed instrument 1, such as a guitar, and the like. Due to the mechanical variations of the construction of most instruments, audio frequencies and

harmonics are attenuated or enhanced based on the location of the sampling transducer.

This invention incorporates a microphone 75 inside the sound cavity 35 of an instrument 1, to capture the acoustic wave pressures as a function of the string(10) energy absorbed in the sound board 20 of the instrument 1, a piezo pressure transducer 105 to directly
5 detect the mechanical resonate energy of the string at the bridge 5, and a magnetic transducer 87 to detect string (10) motion.

These transducers 75, 87, 105 can be connected to a battery-powered 50 preamp 130 built into the body of the device 12. The preamp circuitry 130 allows the player to proportionally control the output levels of these sampling transducer's signals and output
10 this signal to an external audio amplifier 300 as a mixed signal or as a separate channel for each transducer. This allows a broad range of audio frequencies to be adjusted by the player to be more pleasing the listener. The player can manipulate these controls 25MG, 25PI, 25MC and 25MAS on the main body 15 of the device 12 clamped in the sound hole 35 of the instrument 1. The output is made accessible through a connector jack 45 in the
15 side wall of the instrument 1. This device 12 can be field-installable by the player as an after-market modification.

INSTALLATION OF TRIAD DEVICE 12

Referring to Figures 1, 6, 12 and 14, the triad device can be installed in a normal
20 operating position, in instrument 1, with strings 10 in proximity of the magnetic pole screw 40. The housing 15 can be clamped into sound hole 35 on sound board surface 20 by clamp 80 contacting the inside soundboard surface 60 and held in position by a fastener such as a clamping screw 30, wherein the clamp 80 sandwiches a portion of the sound board edge therebetween. An elastomer pad 85 can be placed between the housing

15 and the sound board surface 20 to prevent slippage and to protect the sound board surface. The housing 15 can include a size of no more than approximately 4 & ¼ inches by approximately 1 inch high by approximately 1 inch deep so as to be easily fit into a sound hole 35 of a stringed instrument 1 without having to damage the instrument.

5 MAGNETIC TRANSDUCER 87

Referring to Figures 10 and 12, a magnetic transducer 87 can include a magnet 95, in close proximity to magnetic pole screw 40, that induces magnetic flux through magnetic pole screw 40 and onto ferrous string 10. The instrument string 10, which is set in motion by the player can vibrate within this flux concentration, causing the magnetic
10 field through the magnetic pole screw 40 to vary in close proximity to coil 90. This flux variation causes current flow proportional to the string 10 vibration in coil 90. A resulting electrical signal is sent to the preamp board 130 for signal processing. The magnetic pole screw 40 can be adjusted for string height variations and optimum flux concentration by turning the threaded body of magnetic pole screw 40 into the threaded
15 aperture 140 in the adjustment bar 100. This adjustment can raise or lower magnetic pole screw 40 relative to the instrument string 10.

PIEZO TRANSDUCER 105

Referring to Fig 8, the piezo transducer 105 can be located under bridge 5. The
20 string 10, set in motion by the player, vibrates, which propagates through bridge 5 and onto Piezo transducer 105. When piezoelectric material in the piezo transducer 105 is compressed by this vibration, an electric charge collects on its surface which is proportional to the instrument string 10 vibration. This electrical signal can be sent to the Fig 12 preamp board 130 via piezo pickup connector harness 65 for signal processing.

MICROPHONE TRANSDUCER 75

Referring to Figures 6 and 12, a microphone 75 is press-fitted into a microphone aperture 145 on interface board 130. (This is located within the confines of the resonator cavity 150.) The instrument string 10, set in motion by the player, vibrates, which propagates through bridge 5, through the saddle 2 and onto the soundboard surface 20. This vibrating motion translates to acoustic wave energy in the resonator cavity 150, which is detected by microphone 75, creating an electrical signal sent to the interface board 130 for signal processing.

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OPERATION

Referring to Figures 12, 19, and 20, the signal for microphone 75, piezo transducer 105 and magnetic transducer 87(magnetic coil 90) can be sent to the preamp board 130 for signal processing. The Fig. 19 schematic shows the circuit configuration for all input signals to be amplified and mixed into one composite output signal. The Fig 20 schematic shows the circuit configuration for all input signals to be amplified and the transducer signals to be output individually.

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Referring to Figures 1-18, the proportion of the transducer signal strength is controlled by one transducer potentiometer 25MG, 25PI, 25MC, dedicated to each transducer, and one master volume potentiometer 25MAS for volume. The signal levels are controlled by the player turning the potentiometer knob 25MG, 25PI, 25MC attached to each potentiometer. The knobs 25MG, 25PI, 25MC and 25MAS can be disc shaped with raised knurled edges for easy turning by the user. The location of the knobs allows the user to use one finger to turn the knobs to desired settings. The knob controls are

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easily reachable to the user's fingers while the fingers are on the strings. The device 12 is powered by battery 50 such as a 9 volt battery connected to preamp board 130 by battery connector harness 55 located in resonator cavity 150. The battery 50 is secured by battery clip 160 and adhesive pad 170 attached to the inside wall 185 of the resonator cavity 150.

- 5 The output signal is sent to the output jack 45 via the output connector harness 70. Output jack 45 from 2 conductor cable 43 is attached to the inside wall 185 of the resonator cavity 150 and secured with output jack nut 195.

Referring to Figures 12, 16 and 18, the housing 15 holds magnetic pole screw 40 in the position in the Magnet Pole Screw Aperture 175, a molded feature of the housing
10 15. Magnetic pole screw 40 is also constrained by the adjustment bar 100 which clamps the coil 90 and magnets 95 by means of the coil retainer screws 120 and screw boss 180, a molded feature of housing 15. The control circuit board 110 is held in place by the housing slot 125 in housing 15 and is soldered to the preamp board 130. The preamp board 130 is secured to housing 15 by preamp board retainer screw 115 and screw bosses,
15 a molded feature of housing 15.

Referring to Figures 1 and 13-18, each of the four volume controls, 25MG, 25PI, 25MC and 25MAS, on the triad device 12 can include volume indication setting levels. In a preferred embodiment on each control, there can be three settings for volume indicators. For example, One hash mark can be equal to zero volume; two hash marks
20 can be equal to approximately 50% volume;, and three hash marks can be equal to approximately 100% volume. By first using the three pickup volume controls 25MG, 25PI, 25MC, an infinite number of blends can be attained. Once the desired tone is achieved, the overall volume can then be controlled by the master control 25MAS.

In order to start using the triad pickup device 12, all the controls 25MG, 25PI, 25MC and 25MAS should be turned to their lowest setting. Next, a high quality, low capacitance type cable 310 should be used to connect the stringed guitar instrument 1 to an external amp 300. Blending the output of the stringed instrument can include the

5 following steps:

1. Adjust the MASTER control, 25MAS to approximately 2/3 volume.
2. Adjust the MIC control 25MC to a comfortable level, somewhere around approximately 50%. If feedback is heard, then lower control slightly. This microphone tone will sound very acoustic and can actually be used independently.
- 10 3. Adjust the PIEZO control 25PI until you hear brilliant higher tones with good acoustic quality. This control can be adjusted slightly higher than the MIC control 25MC.
4. Adjust the MAG control 25MG until you hear deep lows, a strong mid-range, and plenty of sustain. With all three pickups now functioning, you will only need to fine tune your settings to the room acoustics.
- 15 5. Adjust the master volume 25MAS which controls overall volume control for all 3 pickups to a desired playing volume.

Although the preferred embodiment described in reference to Fig. 1 shows a mono output with a single external amplifier 300 that is attached to the pickup device 12 by line
20 310 to a 2-conductor stereo output plug 195(Fig. 11A), the invention can be modified for three pickup amplifier sound 200. The novel triad pickup device 12 can be connected to three separate external amplifiers 235, 245, 255 through output jacks 230 for each of the microphone transducer, 240 for the piezo transducer, and 250 for the magnetic transducer,

so that each pickup can be connected to its own amplifier. Thus, each pickup can be tone modified for the best possible sound.

5 A 4-conductor cable line 210 can be hard wired directly to housing 15 with a 4 conductor output jack 215. A 4 conductor jack 220 can connect output jack 215 to three separate outputs 230, 240, 250 by an external cable 225. Microphone Output jack 230, Piezo Transducer Output jack 240 and Magnetic Transducer Output jack 250 can then be connected to respective external amplifiers 235, 245, 255 so that each of the pickup transducers can each be individually tone modified for sound.

10 The invention can also include separate inputs for treble, middle and bass for each of the pickup transducers.

Although the preferred embodiment references three volume settings for each of the volume knob controls, the invention can include other numbers of settings, such as for example up to approximately nine settings(0, 1, 2, 3, 4, 5, 6, 7, 8, 9)

15 While the invention has been described, disclosed, illustrated and shown in various terms of certain embodiments or modifications which it has presumed in practice, the scope of the invention is not intended to be, nor should it be deemed to be, limited thereby and such other modifications or embodiments as may be suggested by the teachings herein are particularly reserved especially as they fall within the breadth and scope of the claims here appended.